relative intensities and conducting power of several of the metals: but previously to engaging in this inquiry, he made a series of experiments, with a view of determining the law of intensities as depending upon the length and diameter of the wire through which the current is transmitted. For this purpose it was necessary to devise means of making and breaking the contact in as invariable a manner as possible. This he accomplished by letting the same weight fall from a constant height when the contact was to be broken, and suddenly relieving the cylinder of the tension caused by the same weight when the contact was to be formed. He ascertained that portions of wire connected with the one which formed the circuit, but not included in the circuit itself, had scarcely any influence on the intensity of the current. He then enters into various theoretical investigations as to the mode of deducing the absolute intensities of the currents in this mode of experimenting.

By comparing the intensity of the electricity in wires of one metal with that in wires of each of the others, by means of the arrangement described in the beginning of the paper, and taking a mean of the results, he found the relative intensities in the following metals to be, silver 1520, gold 1106, copper 1000, zinc 522, tin 253, platinum 240, iron 223, and lead 124. The author compared these results with those obtained by Davy, Becquerel, Professor Cumming, and Mr. Harris, and states what he considers may have been the causes of the differences.

The second object of the author's inquiry relates to the law of variation of the intensity of the electricity excited in wires of different diameters: for determining which he compares the effects of three different wires of which the diameters were in the proportion of 4, 2, and 1. The results occupy several tables: and the deduction from them, with regard to the law in question, is, that the intensity varies nearly as the square of the diameter: but several causes contribute to interfere with the accuracy of this determination, and to exhibit the power as a mean of 1·844 instead of 2; the principal of which is the action of the coils upon each other.

By other methods, in which two wires of different lengths and diameters are placed so as to oppose each other in their effects, the accuracy of the conclusion that this power is the square, was satisfactorily established. Hence he arrives at the general conclusion, that the intensity or conducting power varies as the mass or weight directly, and as the square of the length inversely.

A paper was then read, entitled, "Note on the Tides." By John William Lubbock, Esq. V.P. and Treasurer of the Royal Society.

This communication contains some interesting results which Mr. Lubbock has obtained from observations made at Plymouth, Portsmouth, and Sheerness, under the superintendence of the Masters attendant at those dockyards. Mr. Dessiou has, with extraordinary perseverance, just completed the discussion of about 6000 additional observations of the tides at the London Docks, with a view to found on a more certain basis the corrections of the moon's parallax and

declination. The results which he has obtained are utterly irreconcilable with the theory of Bernoulli, and therefore the tables computed upon that theory must be rejected as inaccurate.

A paper was also read, entitled, "On the Nature of Sleep." By A. P. W. Philip, M.D. F.R.S. L. & E.

The author intends the present paper as a continuation of his inquiries into the relations subsisting between the nervous and muscular systems, which form the subject of his former papers, but which would be incomplete without the consideration of their condition during sleep. With this view he proposes to determine the particular organs, on the condition of which this peculiar state of the system depends; the laws by which it is governed; and the influence it has upon other parts of the system. The necessity of intervals of repose applies only to those functions which are the medium of intercourse with the external world, and which are not directly concerned in the maintenance of life. The organs subservient to these two classes of functions may be viewed as in a great degree distinct from one another. The brain and spinal marrow constitute alone the active portions of the nervous system. The law of excitement, which regulates the parts connected with the sensorial functions, including sensation, volition, and other intellectual operations, and the actions of the voluntary muscles, is uniform excitement, followed by a proportional exhaustion; which, when occurring in such a degree as to suspend their usual functions, constitutes sleep; all degrees of exhaustion which do not extend beyond the parts connected with the sensorial functions being consistent with health. On the other hand, the law of excitement of those parts of the brain and spinal marrow which are associated with the vital nerves, and are subservient to the vital functions, is also uniform excitement; but it is only when this excitement is excessive that it is followed by any exhaustion; and no degree of this exhaustion is consistent with health. The law of excitement of the muscular fibre, with which both the vital and sensitive parts of the brain and spinal marrow are associated, namely, the muscles of respiration, is interrupted excitement, which, like the excitement of the vital parts of these organs, is, only when excessive, followed by any degree of exhaustion. The author conceives that the nature of the muscular fibre is everywhere the same; the apparent differences in the nature of the muscles of voluntary and involuntary motion depending on the differences of their functions, and on the circumstances in which they are placed: and he concludes, that, during sleep, the vital, partaking in no degree of the exhaustion of the sensitive system, appears to do so simply in consequence of the influence of the latter on the function of respiration, the only vital function in which these systems co-operate.

The author proceeds to make some observations on the cause of dreaming, the phenomena of which he conceives to be a natural consequence of the preceding proposition. In ordinary sleep, the sensitive parts of the brain, with which the powers of the mind are associated, are not in a state of such complete exhaustion as to preclude their being excited by slight causes of irritation, such as those which